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# Two new genera of Rogadinae (Insecta, Hymenoptera, Braconidae) from Thailand

Donald L. J. Quicke[1,2,†], Buntika Areekul Butcher[3,‡]

**1** *Department of Biology, Imperial College London, Silwood Park Campus, Ascot, Berks SL5 7PY, UK* **2** *Department of Entomology, Natural History Museum, London SW7 5BD, UK* **3** *Department of Biology, Faculty of Science, Chulalongkorn University, BKK 10330, Thailand*

† *urn:lsid:zoobank.org:author:4FAA3C17-13D3-467B-AAA5-82B27FE783EF*
‡ *urn:lsid:zoobank.org:author:3AC486D1-9045-44FB-9FE4-FF71A0C2909C*

Corresponding author: *Donald L. J. Quicke* (d.quicke@imperial.ac.uk)

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## Abstract

*Confusocentrus panturat* **gen. n.**, **sp. n.**, and *Quasimodorogas confusus* **gen. n.**, **sp. n.**, both from Thailand, are described as new and illustrated. *Confusocentrus* has a long ovipositor, no division between face and clypeus, an enlarged and heavily sclerotized and sculptured syntergite with subsequent ones weakly sclerotized and retracted. It resembles an heavily sculptured *Clinocentrus* species except for the merged face and clypeus, and the lack of transverse sculpture on the 3rd tergite. *Quasimodorogas* has a claw with a pointed basal lobe and an highly humped mesosoma, short metasoma, and a basally very narrow 1st metasomal tergite thus showing affinities with the *Colastomion* subgroup of the Rogadini. In addition it has various unique features including no separation between the base of the hind tibial spurs (unlike in *Aleiodes* with comb, in which it is interupted at level of inner spur) and metasoma with foveolate tergites 2–5.

## Keywords

Rogadini, Clinocentrini, *Aleiodes*, parasitoid, new species, Malaise trap, *Kerevata*

## Introduction

The Rogadinae fauna of the tropics is poorly understood. In recent years, the faunas of the New World, Africa and China have been reviewed at genus level (Achterberg

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1991, Chen and He 1997, Shaw 1997), and several new genera erected (Achterberg 1989, 1995, Achterberg and Chen 1996; Belokobylskij 1999, Chen et al. 2004, Long and van Achterberg, 2008). Subsequently, a few genera have been sunk into synonymy with the enormous cosmopolitan genus *Aleiodes* Wesmael based on molecular data) supported in part also by studies of the female venom apparatus and the nature of the mummified host and the wasps emergence from it (Zaldivar-Riverón et al. 2004, 2009, Quicke and Shaw 2005, Areekul Butcher and Quicke 2011).

The rogadine fauna of SE Asia is virtually unknown at species level with probably 90% of species currently undescribed. The only exception being the distinctive genera of the Spinariini which have been revised by van Achterberg (2007). Examination of hundreds of specimens of Rogadinae collected by the TIGER project which involved Malaise trap sampling in 30 different parks and at 559 individual sites across Thailand over three years has revealed a large number of new species, especially of *Aleiodes*, and these will be described elsewhere. Among this material we have two rogadine specimens that can not be satisfactorily placed in any currently recognised genus, and these are described and illustrated here prior to their inclusion in a global phylogenetic analysis of the group based on both morphological and molecular data. Preliminary molecular analyses confim that neither genus is derived within representatives of other sampled genera.

Terminology follows van Achterberg (1988) repeated in Chen and He (1997). Sculptural terms follow Harris (1979). Types are deposited in the Queen Sirikit Botanic Garden insect collection in Chiang Mai (QSBG).

## Systematics

***Confusocentrus* gen. n.**
urn:lsid:zoobank.org:act:E14B66D7-6719-4403-B706-9EA023D974BA
http://species-id.net/wiki/Confusocentrus
Figs 1, 2

**Type species.** *Confusocentrus panturat* sp. n. by monotypy

**Morphology.** *Head.* Median flagellomeres longer than wide. Annelus without distinct circular oblique carina. Face and clypeus with no externally visible separation, both smooth and shiny. Hypoclypeal depression not strongly arched. Malar suture absent. Mandibles twisted so that only upper tooth visible in frontal view. Eyes moderately emarginated opposite antennal sockets. Head strongly narrowed behind eyes. Occipital carina complete and strong.

*Mesosoma.* Largely shiny. Pronotum moderately produced into a shelf, anterior margin strongly upcurved; antero-dorsally with a well-developed, posteriorly directed, 'V'-shaped carina. Notauli deep and crenulated. Mesoscutum with a deep longitudinal medial depression posteriorly between notauli. Prepectal carina strongly developed.

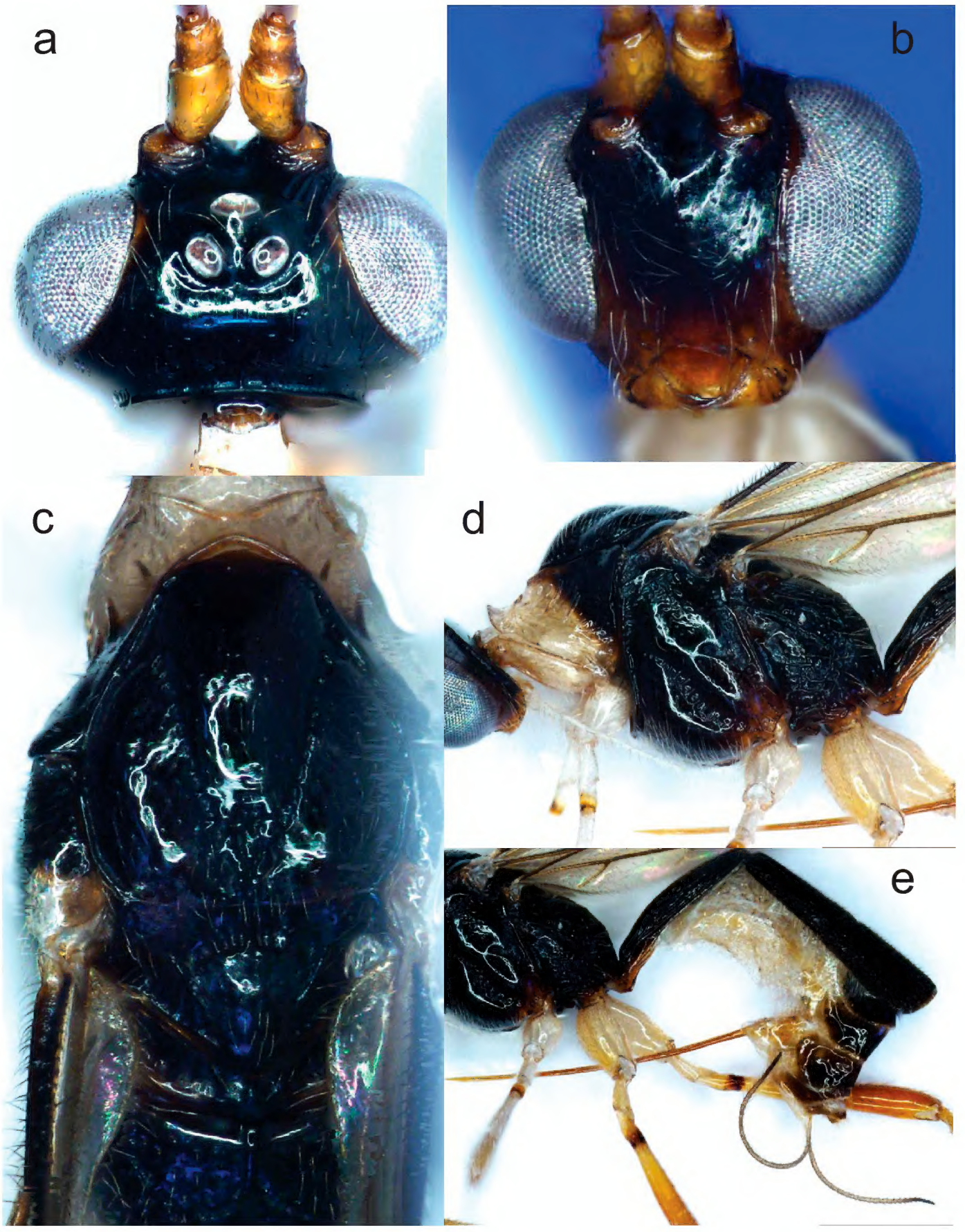


**Figure 1.** *Confusocentrus panturat* gen. n., sp. n., holotype, CellD® light micrographs. **A** Top of head **B** head, front view **C** thorax, dorsal view **D** mesosoma, lateral view **E** posterior mesosoma, metasoma and ovipositor, lateral view.

Precoxal suture deep, sigmoidal, crenulated. Propodeum with midlongitudinal carina on anterior third, otherwise with confused rugose sculpture.

*Fore wing.* Vein M+CU distinctly angled medially and thickened beyond angulation. Vein 1-CU1 and its junction with cu-a strongly thickened. Subbasal cell with a

narrow line of reduced setosity paralleling and close to distal segment of M+CU. Vein 1-SR almost absent. Vein r arising slightly beyond middle of pterostigma.

*Hind wing*. Veins M+CU and 1-M approximately the same length. Vein 2-SC+R longitudinal. Vein m-cu present, pigmented and reclivous. Vein SR indicated by a pigmented fold.

*Legs*. Claws simple. Apex of hind tibia with a well-developed comb of specialised adpressed setae both medially and ventrally between spurs.

*Metasoma*. Tergites 1 to 3 forming a narrow, heavily sculptured carapace, subsequent tergites weakly sclerotised and concealed. First metasomal tergite elongate, subbasally narrowed; dorsal carinae uniting to form complete midlongitudinal carina. 2nd tergite with a small midbasal triangular area produced into a midlongitudinal carina that extends beyond middle of tergite. Ovipositor strongly exserted,

**Etymology.** Name in reference to the difficulty of the systematic placement of the new genus and an allusion to the great oriental philosopher Confucius and punned with *confusio* [Latin for "confusion"], in combination with part of the name of the apparently related genus *Clinocentrus*.

**Notes.** In the key to genera of Chinese Rogadinae (Chen and He, 1997), the only available key to taxa from the region, *Confusocentrus* will falter at couplet 2, because while it has hind wing vein cu-a and a long ovipositor, it does not have an areolate propodeum and the third tergite is strongly foveolate with no transverse sculpture, and has a well-developed lateral crease.

Placement of this genus within the Rogadinae is indicated by the midlongitudinal carina on the 1st and 2nd metasomal tergites (apomorphic). An affinity with the tribe Clinocentrini is tentative as, with the exception of the absence of a malar suture, the uniting characters are all likely to be symplesiomorphies, such as the relatively long ovipositor. *Confusocentrus* lacks the transverse curved sculpture on the 3rd metasomal tergite that characterises many *Clinocentrus* Haliday and *Tebennotoma* Enderlein, though this feature is not present in all species (Belokobylskij 1995, 2000); has fore wing vein CU1b present unlike *Tebennotoma*; has the dorsal carinae of tergite 1 uniting to form a midlongitudinal carina unlike *Artocella* van Achterberg. The clinocentrine genus *Kerevata* described by Belokobylskij (1999) from New Britain, also has the three basal metasomal tergites rather enlarged (but not forming a carapace to the same extent) and has the distal part of the fore wing subbasal cell modified with thickened veins but in this case the distal part of M+CU is curved, and vein cu-a is strongly thickened and curved, these together forming an oval expansion of the subbasal cell. *Kerevata* also differs from *Confusocentrus* gen. n. in having the hind wing vein 2-SC+R transverse, tergites 1–3 longitdinally striate and the annellus with an oblique, circular distal carina. All these other Clinocentrini have the clypeus well separated from the face.

Preliminary molecular analyses indicate a relationship with the Clinocentrini, but within this group these is little support for most relationships, and with the currently

available sequences, *Clinocentrus* as currently recognised, does not itself appear to be monophyletic.

***Confusocentrus panturat* sp. n.**
urn:lsid:zoobank.org:act:18C6DCC2-3E25-4DAA-AAE2-69657E54AE7E
http://species-id.net/wiki/Confusocentrus_panturat
Figs 1, 2

**Material examined.** Holotype female, Thailand, Surat Thani, Khao Sok N P., Klong Morg unit, 8°53.725'N, 98°39.025'E, 87 m, 2.xii.2008, coll. Pongphan, DNA voucher BCLDQ01571 (QSBG).

**Morphology.** Length of body 6.4 mm, of fore wing 4.5 mm and of ovipositor 2.3 mm.

*Head*. Antenna broken in only known specimen, minimally with 39 flagellomeres. First flagellomere 1.4 × length of second, and 1.45 × length of 3rd flagellomere. Face smooth and shiny with sparse setosity. Width of face: Height of eye: width of head = 1.0:1.35:2.3. Frons with 2 pairs of weak carinae paralleling margin of eye just behind antennal sockets. Shortest distance between posterior ocelli: transverse diameter of posterior ocellus: shortest distance from posterior ocellus and eye = 1.0:2.3:2.3.

*Mesosoma*. Dorsope deep and slit-like. Mesopleuron with deep, sigmoidal, rather narrow, crenulated precoxal suture; with crenulations along posterior edge of prepectal carina; with crenulated plural suture.

*Fore wing*. Length of veins r: 3-SR: SR1 = 1.0: 1.67:5.2. Vein m-cu approximately same length as vein 2-SR+M. Vein 1-CU1 0.5 times length of 2-CU1.

*Hind wing*. Without vein 1–1A. Vein M+CU 0.9 times length of 1-M (measured to junction with 2-M).

*Legs*. Lengths of fore femur: tibia: tarsus: basitarsus = 2.3: 2.75: 3.16: 1.0. Length of hind femur:tibia: tarsus = 1.5: 1.9 : 2.3: 1.0.

*Metasoma*. First tergite 2.1 × longer than posteriorly wide, petiolate, narrowest part 0.37 × width at widest part. Second and third tergites foveolate to fovelolate-rugulose. Second tergite 1.13 times longer than maximally wide; 1.13 times longer medially than 3rd tergite. Third tergite with weak emargination postero-medially. Ovipositor sheaths approximately 0.85 × length hind femur (excluding trochantellus).

*Coloration*. Head and body largely black: lower part of face brownish, pronotum and propleuron ivory white. Legs largely orange-brown with coxa and trochanter largely ivory white, trochantellus black. Winks clear to hyaline with dark browm-black venation and pterostigma.

**Etymology.** Panturat is the name of a mountain, a giant lying on his side, near the collection site of the holotype.

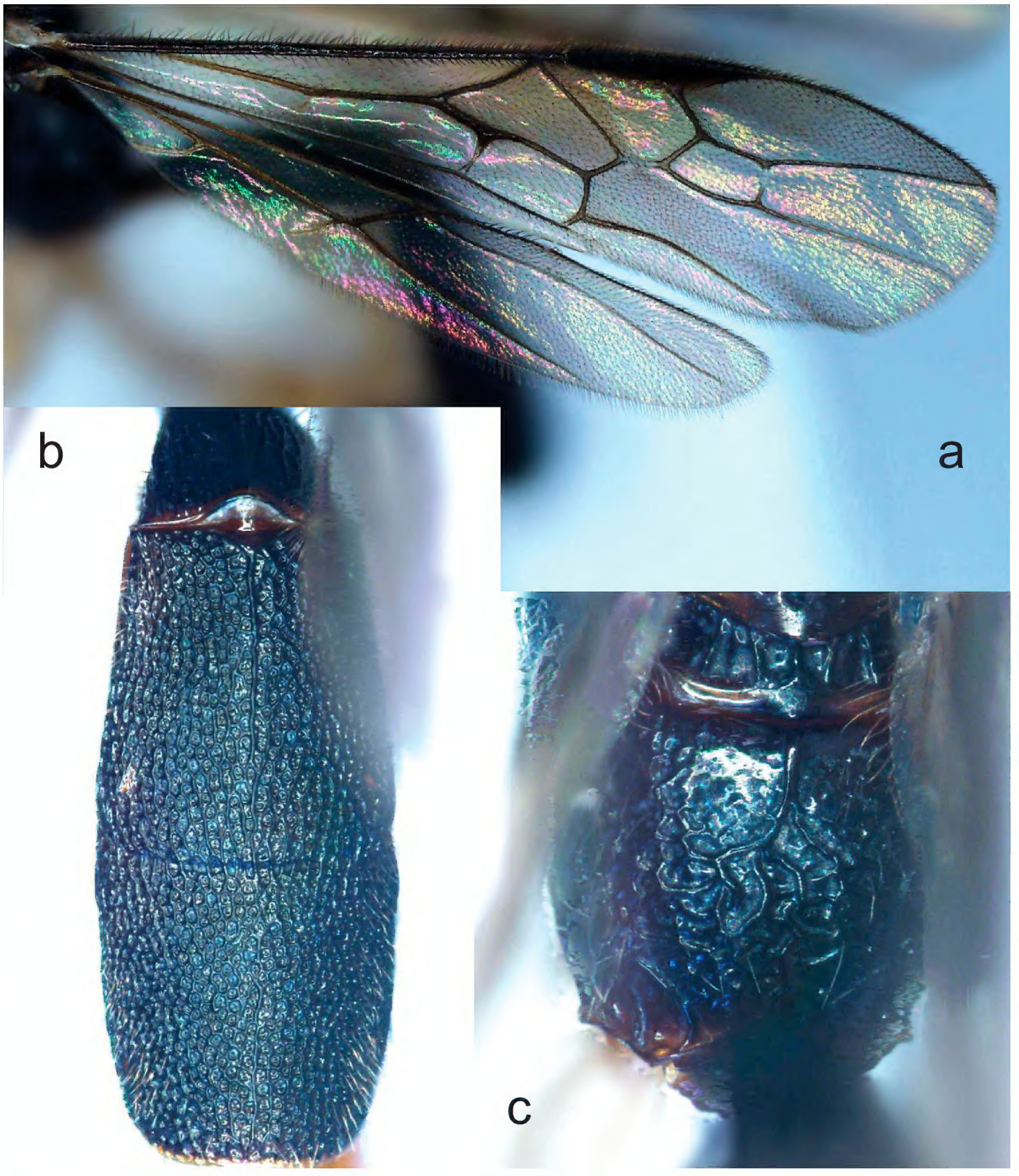


**Figure 2.** *Confusocentrus panturat* gen. n., sp. n., holotype, CellD® light micrographs **A** Wings **B** metasomal tergites 2 and 3, dorsal view **C** propodeum.

***Quasimodorogas* gen. n.**
urn:lsid:zoobank.org:act:E3A546E6-B729-4883-A32E-4CFBC0DFD5F1
http://species-id.net/wiki/Quasimodorogas
Figs 3, 4

**Type species.** *Quasimodorogas confusus* sp. n. by monotypy

**Morphology.** *Head*. Antennae much longer than fore wing, with more than 50 flagellomeres. Terminal flagellomere strongly acuminate. Median flagellomeres longer than wide, with setae mostly longer than width of flagellomere. Malar suture deep. Face with fine transverse striation. Occipital carina complete. Labial and maxillary palps (of female) without swollen segments.

*Mesosoma*. Very short and tall, hardly longer than high; largely smooth and shiny. Pronotum not produced into a conspicuous neck. Mesoscutum with well-developed crenulate notauli. Middle lobe of mesoscutum with deep, crenulated longitudinal groove posteriorly. Propodeum with short midlongitudinal carina anteriorly.

*Fore wing*. Vein 1-M rather strongly curved and with a small basally directed knob near it's junction with M+CU. Vein 1-SR+M nearly straight, slightly curving posteriorly. Vein m-cu weakly curved but not forming a continuous curve with vein 2-CU1. Basal cell largely glabrous on posterior half. 2nd submarginal cell long and narrow. Subbasal cell largely glabrous except at apex. Vein cu-a rather strongly curved. Vein CU1a well developed, tubular for more than half its length.

*Hind wing*. Vein 1-M distinctly bent just before apex. Vein m-cu absent. Vein SR1 not strongly widening distally, more or less parallel to anterior margin of wing. Vein 1r-m curved. Vein 1–1A distinct.

*Legs*. Claws with large pointed, pale coloured basal lobe. Hind tibia with large, apico-medial and apico-ventral comb of specialised adpressed setae; the ventral portion not divided by gap at level of inner spur. Hind tibial spurs setose and distinctly but not strongly curved.

*Metasoma*. Metasoma short, tergites 2 to 5 with strong sculpture. First tergite strongly narrowed subbasally; dorsal carinae uniting to form irregular but distinct midlongitudinal carina. Tergite 2 with a small mid-anterior triangular area produced into a complete midlongitudinal carina. 2nd suture deep and crenulated. Tergites 2–5 with well-developed lateral crease. Hypopygium small, weakly sclerotized, weakly convex ventrally,

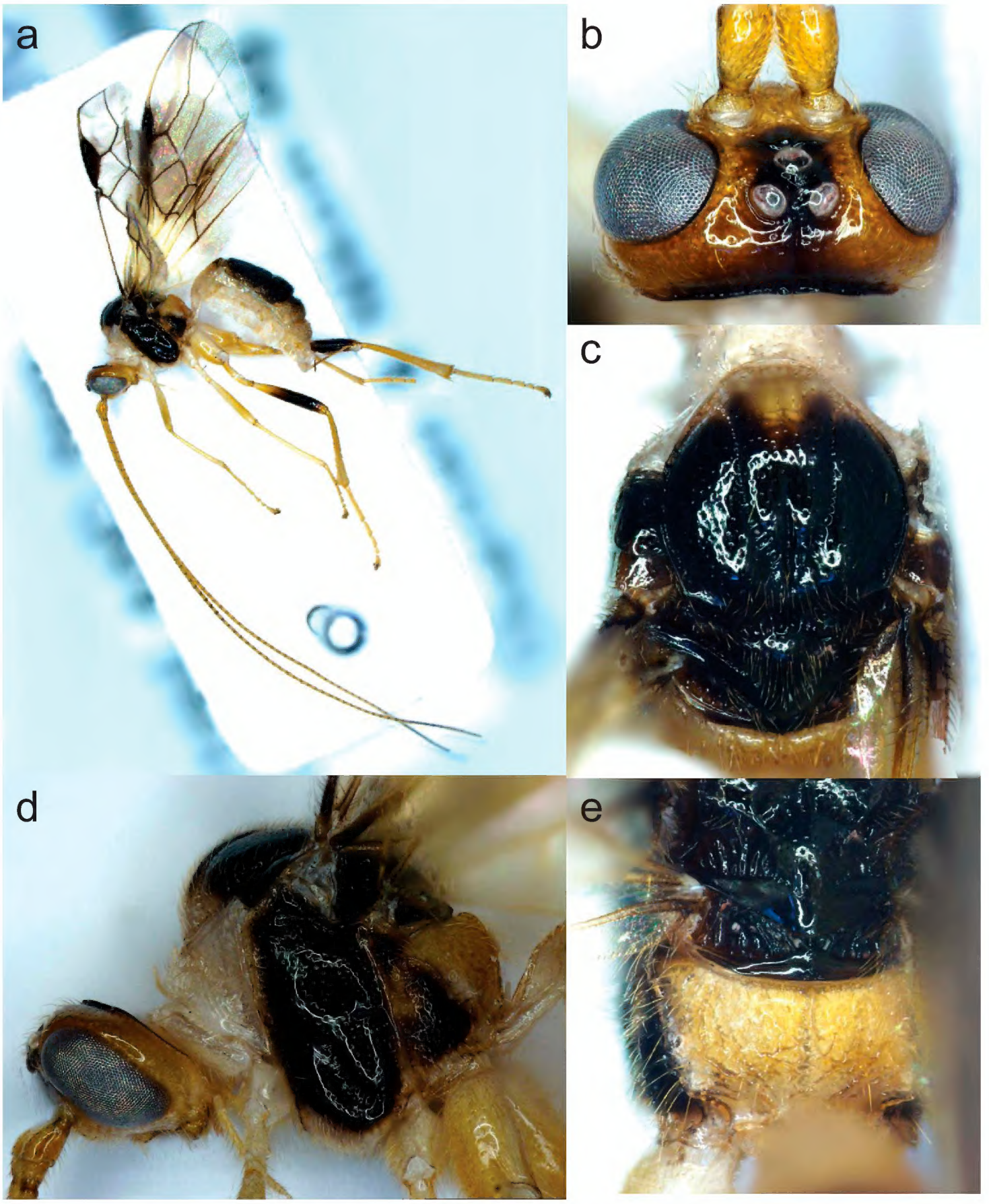


**Figure 3.** *Quasimodorogas confusus* sp. n. holotype, CellD® light micrographs **A** Habitus **B** top of head; **C** mesonotum and scutellum **D** head and mesosoma, lateral view **E** metanotum and propodeum.

**Etymology.** Named after the famous character in the novel *The Hunchback of Notre Dame* by Victor Hugo, and the generic name *Rogas*.

**Notes.** Within the Rogadinae s.s. those taxa with a large pointed basal lobe appear to belong to a monophyletic group, though not all members of that group have a claw with a pointed basal lobe. This group was referred to as the Rogadini by Zaldivar-Riverón et al. (2009) and in S. E. Asia comprises the genera *Canalirogas*

van Achterberg & Chen, *Colastomion* Baker, *Conspinaria* Schulz, *Cystomastocoides* van Achterberg, *Darnilia* van Achterberg, *Gyroneuronella* Baker, *Iporhogas* Granger, *Macrostomion* Szépligeti, *Megarogas* Szépligeti, *Rogas* Nees, *Rogasella* Chen & He, *Rogasodes* Baker , *Triraphis* Ruthe, *Troporogas* Cameron and *Trigonoplatnus* Cameron. Within this group, *Colastomion*, *Cystomastocoides*, *Macrostomion* and *Megarogas* have the first metasomal tergite rather elongate and strongly narrowed sub-basally, almost certainly an apomorphic state, associated with a long metasoma as an whole, and usually with a ventrally convex hypopygium. In addition, these genera have largely glabrous and strongly curved hind tibial spurs, as do the extralimital genera *Myocron* van Achterberg and *Cystomastax* Enderlein. *Quasimodorogas* gen. n. differs from all of these in having a short, stout body with the mesosoma less than 1.1 times longer than high, and with the hypopygium small and only weakly convex ventrally and the hind tibial spurs completely setose and not strongly curved. It is therefore possible that the anteriorly narrowed 1st metasomal tergite in the new genus represents a parallelism rather than synapomorphy. It differs from all other Asian Rogadinae, except *Confusocentrus* gen. n., in its strongly foveolate metasomal sculpture.

Preliminary molecular analyses suggest that *Quasimodorogas* gen. n. is relatively closely related to *Rogasella* Baker, *Rogasodes* Chen & He, *Gyroneuron* Kokujev, *Gyroneuronella* Baker, but is not nested within any of these genera.

***Quasimodorogas confusus* sp. n.**
urn:lsid:zoobank.org:act:A2A3F287-6E71-4000-9AF8-83FE06CC9DC9
http://species-id.net/wiki/Quasimodorogas_confusus
Figs 3,4

**Material examined.** Holotype female, Thailand, Nam Province, Doi Phu Kha N P, office 19°12.458'N, 101°4.866'E, 1359 m, 29.xi.2007, coll. Charoen & Nikom collection code T3259, DNA voucher BCLDQ01600 (QSBG).

**Morphology.** Length of body 5.5 mm, fore wing 6.0 mm, of antenna 12.0 mm and of ovipositor 1.1 mm.

*Head*. Antenna with 63 flagellomeres. Mesian flagellomeres approximately 3.7 × longer than wide. First flagellomere 1.3 × longer than both the 2nd and 3rd separately. Face with fine transverse striation angled upwards medially. Height of eye: width of face: width of head (across eyes) = 1.42: 1.0: 2.3. Frons, vertex and occiput shiny. Frons with depressions on either side just in front of anterior ocellus. Shortest distance between posterior ocelli: transverse diameter of posterior ocellus: shortest distance from posterior ocellus and eye = 1.0:2.0:2.0. Back of head with a distinct longitudinal groove running between occipital carina and posterior ocellus; with crenulation along whole of anterior edge of occipital carina.

*Mesosoma*. 1.05 × longer than tall. Scutellar sulcus with 5 strong carinae between the outer ones. Propodeum with distinct small medio-lateral tooth-like process.

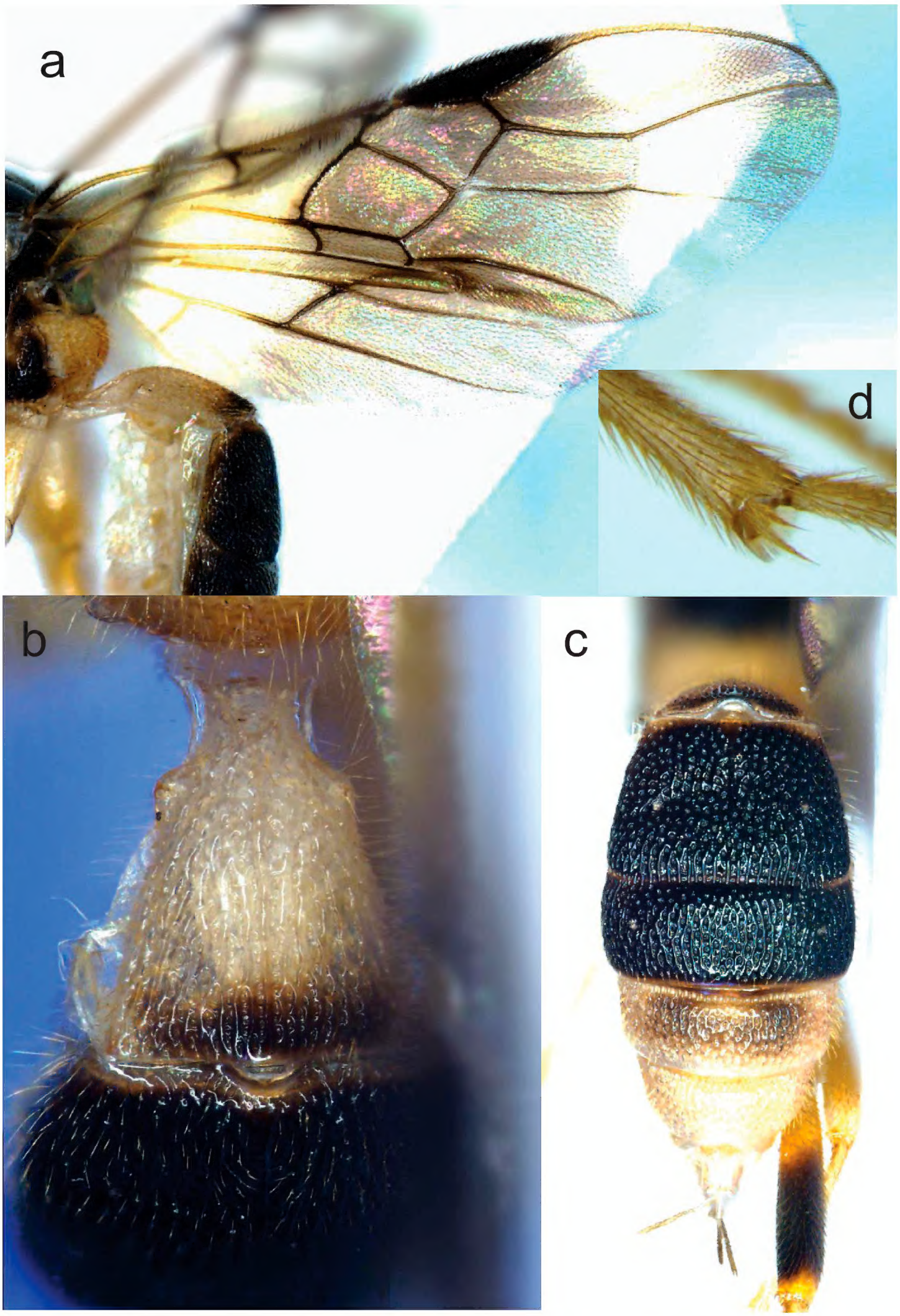


**Figure 4.** *Quasimodorogas confusus* sp. n. holotype, CellD® light micrographs **A** Wings and anterior metasoma, lateral view **B** 1st metasomal tergite, slightly postero-dorsal view **C** metasomal tergites 2–5, dorsal view **D** ventro-lateral view of apex of hind tibia showing specialised setal comb, and closely spaces spurs.

*Fore wing.* Lengths of veins r:3-SR:SR1 = 1.0:3.5:5.7. Vein 3-SR approximately 2.5 × length of r-m. Vein cu-a strongly curved. Vein 2-CU1 approximately 5 × length of 1-CU1, the latter distinctly thickened.

*Legs.* Lengths of fore femur : tibia: tarsus: basitarsus = 1.9: 2.0: 2.25: 1. Lengths of hind femur: tibia: tarsus = 1.0: 1.2: 1.25. Hind basitarsus equal in length to tarsal segments 2, 3 and 4 combined and approximately 10 × longer than maximally deep.

*Metasoma.* Tergites 1–5 strongly foveolate. 1st tergite approximately 1.4 × longer than maximally wide; 2.3 × wider posteriorly than at its narrowest. Tergite 2 1.5 × wider than medially long; 1.4 × longer than 3rd. 2nd suture weakly bisinuate, wide.

*Coloration.* Antennae yellow basally becoming dark apically, the pale segments narrowly spotted black at apex. Head brown yellow becoming black posterodorsally including stematicum and centre of frons. Mesosoma largely black, pronotum and anterior of mesoscutum white, propodeum brown yellow. Wings with a broad smokey transverse band and small smokey grey patch at apex; venation yellow in parts where membrane not pigmented, black where membrane is smokey, including whole of pterostigma. Legs yellow with white coxae, but with hind femur largely black. Metasoma largely white but posterior of tergite 1 narrowly, and all of tergites 2+3 black.

**Etymology.** Based on the confusing combination of characters.

## Acknowledgements

We are grateful to Mike Sharkey (Hymenoptera Research Institute, University of Kentucky) for allowing us access to material collected by the TIGER project from which the 2 specimens described here came, and which was funded by NSF grant (DEB 0542864). The Animal Systematic Research Unit and Integrated Ecology Lab, Department of Biology, Faculty of Science, Chulalongkorn University kindly allowed use of their Cell^D® imaging facility. This work was partly supported by BRT (R152126) and a Chulalongkorn University Centenary Academic Development Project grant to BAB.

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